

**UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF TEXAS
SAN ANTONIO DIVISION**

WAVE NEUROSCIENCE, INC.,

Plaintiff,

vs.

Civil Action No. 5:23-cv-00626-XR

BRAIN FREQUENCY LLC,

Defendant.

Demand for Jury Trial

**DEFENDANT BRAIN FREQUENCY LLC'S
RESPONSE CLAIM CONSTRUCTION BRIEF**

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I. INTRODUCTION

Defendant Brain Frequency LLC (“Defendant” or “Brain Frequency”) hereby submits its claim construction brief in response to Plaintiff Wave Neuroscience, Inc.’s (“Plaintiff”) Opening Claim Construction Brief (“Brief”) (Dkt. 32), and the accompanying Declaration of Marom Bikson (“Bikson Decl.”).

II. ARGUMENT

A. Intrinsic Frequency (’490 patent: 1; ’408 patent: 1, 2, 12, 20; ’111 patent: 3, 7; ’737 patent: 1-2, 4)

Plaintiff’s Proposal	Defendant’s Proposal
frequency selected to which treatment is to be applied	the frequency (f_0) at which peak signal power in the specified band (E_{\max}) is located
	’111 Patent: Indefinite & Invalid: Not enabled / lacking written description

Plaintiff proposes that “intrinsic frequency” be construed to mean a “frequency selected to which treatment is to be applied.” Under Plaintiff’s proposed construction, an intrinsic frequency can literally be *any* frequency that Plaintiff subjectively deems selectable. That cannot be the case.

First, the fundamental problem with Plaintiff’s proposal is that it does not explain or define *what* an intrinsic frequency *is*. Plaintiff’s position also fails to address *how* to determine whether the selected intrinsic frequency was indeed moved as claimed. Common sense dictates that “moving” a frequency requires measuring that frequency before and after treatment. That can only be done if the “intrinsic frequency” is defined based on some metric, which can be measured. This deficiency is highlighted by Plaintiff’s own expert. Plaintiff’s expert explains that “[e]ach subject has their own internal, *i.e.*, intrinsic, frequency which can be measured by an EEG.” Bikson¶61. Yet Plaintiff fails to explain *what* the intrinsic frequency is or *how* it is measured.

Second, Plaintiff’s proposed construction improperly reads the qualifier “intrinsic” out of the claim language. Its proposal allows moving any frequency selected to which treatment is applied, when the Accused Patents explicitly claim moving an intrinsic frequency of a brain of the subject within a specified EEG band. ’490 Patent, claim 1; ’408 Patent, claims 1, 2, 12, 20; ’111 Patent, claims 3, 7; ’737 Patent, claims 1-2, 4. The patentee could have—but did not—claim simply “selecting a frequency” to move. Rather, the patentee claimed selecting an “intrinsic frequency.” Absent evidence to the contrary, the term intrinsic presumptively carries meaning. *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 950-51 (Fed. Cir. 2006) (“Claims are interpreted with an eye toward giving effect to all terms in the claim.”); *see also Indus. Tech. Rsch. Inst. v. Int’l Trade Comm’n*, 567 Fed. Appx. 914, 918. The becomes even more clear in reference to the claimed “pre-selected intrinsic frequency within the same specified EEG band.” ’408 Patent, claim 2. Given that the claims already instruct when an intrinsic frequency is [to be] pre-selected,” Plaintiff’s proposed construction would result in error rendering the meaning to: “a pre-selected frequency selected.” Plaintiff’s proposed construction is therefore incorrect.

Third, each of Plaintiff’s supporting citations merely *reference* intrinsic frequency, without *defining* it. *See, e.g.*, Brief at 13–15:

- ’408 Patent, 7:12-16; Bikson Dec. ¶ 63 (“influencing an intrinsic frequency”);
- ’408 Patent, 15:5-15; Bikson Dec. ¶ 65 (“the subject's intrinsic alpha frequency”);
- ’408 Patent, 15:16-23; Bikson Dec. ¶ 67 (“the intrinsic alpha frequency”);
- ’490 Patent, 7:4-10; ’737 Patent 7:1-7; Bikson Dec. ¶ 68 (“influencing an intrinsic frequency”);
- ’111 Patent, 2:39-41; Bikson Dec. ¶ 76 (“the brain's intrinsic frequency”);
- ’408 Prosecution History at *800 (September 10, 2012 Amendment in Response to Final Office Action, p. 8); Bikson Dec. ¶ 78 (“the subject’s intrinsic frequency:);

- '737 Prosecution History at *1508 (March 25, 2014, Final Office Action, p. 5); Bikson Dec. ¶ 79. (“an intrinsic frequency”).

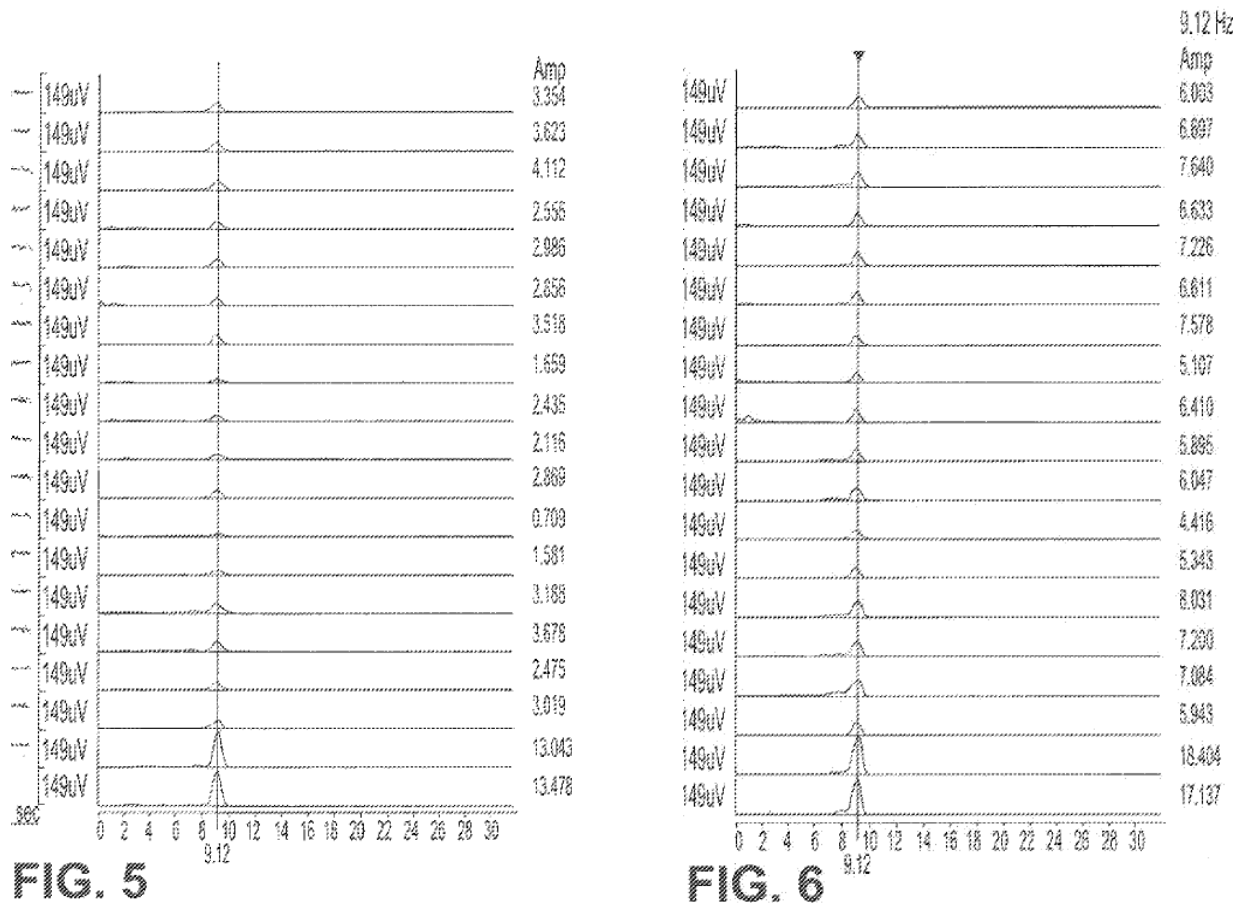
However, none of these references explain or define *what* an intrinsic frequency actually *is*. In contrast, Brain Frequency’s proposal comes from the expressed definition in the specification of the Common Asserted Patents: “the frequency (f_0) at which peak signal power in the specified band (E_{max}) is located.” *See, e.g.*, '490 Patent, 22:19-29. And, since the term has no plain and ordinary meaning in the art (*See* Dempsey Decl. (Dkt. 34-1) at ¶ 20), the Common Asserted Patents must provide a definition, especially when Plaintiff’s expert, Dr. Bikson, admits that that each subject has an intrinsic frequency that can be measured by an EEG. Bikson Decl. ¶61.

Fourth, Plaintiff contends that Brain Frequency’s construction is wrong because it improperly imports “a specific embodiment into the claim.” Brief at 15. Plaintiff however is incorrect. Each description and embodiment of the Common Asserted Patents describe intrinsic frequency consistent with the definition provided in the specification—peak signal power in a given band. Notably, Plaintiff identifies no other embodiments that define “intrinsic frequency” differently, *i.e.*, as anything other than the frequency where peak power is located.

Moreover, the references to Fig. 12 are not exclusive to a single example ('408 Patent at 15:49–55, 47:54–61) as Plaintiff implies (albeit without support). For example, the '408 Patent has 363 instances of the limiting phrase “in some embodiments. . .,” but the paragraphs in the specification describing Fig. 12 are not so limited. To the contrary, the patent states that “FIG. 12 shows an example of the Q-factor as used in this invention. The figure shows . . . [that] frequency f_0 is defined as the intrinsic frequency in the specified band. The Q-factor is defined

as the ratio of $f_0/\Delta f$.” ’408 Patent, 15:49–55, 47:54–61, 52:49–55. Indeed, the inventions definition of the Q-factor cannot be determined without intrinsic frequency f_0 .

Fifth, ironically Plaintiff argues that Figs. 5 and 6 support its position by referencing the term “intrinsic frequency.” Brief at 13-14. However, Plaintiff blatantly ignores the surrounding language which explains that: “[t]he vertical line drawn through the peaks is at 9.1 Hz, the subject’s intrinsic alpha frequency.” Brief at 15 and 16 (*citing* ’408 Patent at 15:5–15 (emphasis added)); *see also* identical Figs. 5 and 6 in the Common Asserted Patents. This can plainly be seen in Figs. 5 and 6:



’408 Patent Figs. 5 and 6; *see* identical figures in ’490 and ’737 Patents. The referenced vertical line shows the frequency at which *peak power* resides among several measured points on the

brain. This corroborates Defendant's position that the intrinsic frequency is the frequency where peak power is located. Plaintiff's proposal that intrinsic frequency could just be any "frequency selected" in that band is directly contradicted by this disclosure. (Notably, the '111 Patent alone includes neither these figures nor the related description).

Sixth, Plaintiff's avails that "Defendant's proposed construction is [] mathematically incorrect," citing the expert declaration of Dr. Bikson. Brief at 16 (*citing* Bikson Decl. ¶¶85–87). However, contrary to Plaintiff's representation, Dr. Bikson provides no such opinion. Dr. Bikson only states that f_0 is the label used for the intrinsic frequency (this is correct), but that there is no marking on the graph indicating that f_0 is precisely at the peak frequency. Bikson Decl. at ¶ 87 (stating that " f_0 does not point toward any specific portion of the curve represented in FIG. 12.") Yet, Dr. Bikson's statement is in direct contradiction of Fig. 12 which shows f_0 as being at peak frequency:

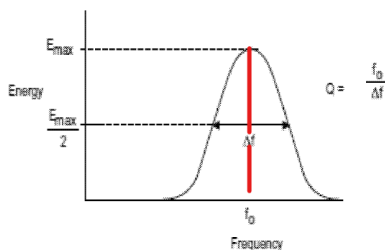


Figure 12

See '737 Patent, Fig 12 (emphasis added by red line) (noting that the intrinsic frequency occurs at peak frequency and the same is true for the vertical intrinsic frequency line in Figs. 5 & 6).¹ The description of the diagram can be relied on, in combination with the drawings, for what they would reasonably teach one of ordinary skill in the art. *In re Wright*, 569 F.2d 1124, 1127-28

¹ Further, there is no requirement that patent drawings are drawn to scale. *Hockerson-Halberstadt, Inc. v. Avia Group Int'l*, 222 F.3d 951, 956 (Fed. Cir. 2000).

(CCPA 1977). In combination with the description, Fig. 12 reasonably teaches one of ordinary skill in the art that f_0 indicates the peak power (*i.e.*, intrinsic) frequency. *See* Dempsey Decl. (34-1) at ¶¶ 20-23.

Finally, and worth note, Plaintiff provides *no* supporting evidence—intrinsic or otherwise—as to “intrinsic frequency” as claimed in the orphan ‘111 Patent. In that instance, the claim term is simply indefinite.

B. “In-Phase” and “Out of Phase” (’408 Patent, 1 and 12; ’490 Patent, 1)

Plaintiff’s Proposal	Defendant’s Proposal
waveforms whose peaks and troughs [do / do not] occur at substantially the same time	waveforms whose peaks and troughs [do / do not] occur at the same time

Here, the parties’ dispute concerns the inclusion of the word “substantially.” Brief at 17. The problem with this claim term—as opposed to other terms such as a “target” where the parties agree that “substantially the same as a target” suffices—is that the claims require determination of whether two magnetic field generators (’408 Patent, claim 1) or two magnetic fields (’408 Patent, claim 12 and ’490 Patent, claim 1) are in-phase or out-of-phase with each other. Plaintiff’s proposal includes the term “substantially” for both terms, which creates an overlap between the two concepts. Under Plaintiff’s proposal, it is unclear where that point of demarcation resides between “in-phase and “out-of-phase” – *i.e.*, at what point would two magnetic fields be in-phase (peaks and troughs occur at substantially the same time) and out-of-phase (peaks and troughs do not occur at substantially the same time). While “substantially” is a term of degree, no guideline is given in the Common Asserted Patents (or by Plaintiff’s expert) as to the delimiters of the term. *See Interval Licensing LLC v. AOL, Inc.*, 776 F.3d 1364, 1371 (Fed. Cir. 2014). Defendant’s proposal, on the other hand, provides a simple guideline as explicitly claimed: two signals are either in-phase or they are not—the peaks and troughs either overlap or they do not. Absent guidance from the

Common Asserted Patents as to how else to draw a distinction between these two claim terms, introducing a non-delimited term of degree in the construction is improper.

Like the claims in *Interval*, the term “substantially” is a subjective term of degree and provides no guidance to one of skill in the art. *See Interval*, 776 F.3d at 1371. The specifications of the ’408 and ’490 Patents fail to provide any information for determining whether the peaks and troughs of two signals occur at substantially the same time or not. Like in *Interval*, the specifications provide “no objective indication” of the meaning of the term “substantially.” *Interval*, 766 F.3d at 1371. This fails the Federal Circuit’s standard set forth in *Nautilus. Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374 (Fed. Cir 2015) (indicating that when “a word of degree is used, the court must determine whether the patent provides some standard for measuring that degrees.”). Introducing this term of degree would be an erroneous construction because the Patents provide no guidance to allow Court or jury to determine when it is met.

Finally, the agreed construction of the term “EEG Phase” as “a measure that conveys the difference, if any, between the timing of peaks and/or troughs in two EEG signals” corroborates Defendant’s position here. Dkt. 29 at 5. The explicit reference to “the difference, if any” clearly indicates that there may, or may not, be a difference in the timing of peaks and troughs. If there is no difference, the signals are in-phase; if there is a difference, the signals are out-of-phase. Notably, the phrase “if any” was added to the proposed construction of EEG phase by Plaintiff. [Maness email of Apr. 18, 2024.]

Plaintiff’s citation to the disclosure that “rotation of the magnets is simultaneous and **generally in-phase**” does not help. This statement merely acknowledges that technological limitations preclude perfection. *Nautilus v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014)

(“the law recognizes that there are inherent limitations in language, and that absolute precision is not always obtainable.”) Therefore, Plaintiff’s construction is unworkable in this context. Since both in-phase and out-of-phase are claimed, a POSITA practicing the invention must be able to tell the difference between the two.

C. “Improving A Physiological Condition Or A Neuropsychiatric Condition”

(’111 Patent: 1)

Plaintiff’s Proposal	Defendant’s Proposal
to make or become better [the medical conditions in the claim]	“Improving the MMSE score” for Alzheimer’s disease, and indefinite and unpatentable subject matter for any other condition

First, Plaintiff’s reference to its U.S. Patent No. 9,446,259 (the ’259 Patent”) is irrelevant. The ’259 Patent belongs to a different patent family and does not derive from the same application.² The construction of an unrelated patent by a different court is neither relevant nor binding on this Court. Similarly, the cases Plaintiff cites in support (Brief at 20) are inapposite and relate to “construing claim[s] in patents that derive from the same parent application and share common terms,” in which case “we must interpret the claims consistently across all asserted patents.” *Capital Mach. Co. v. Miller Veneers, Inc.*, 524 F. App’x. 644, 647 (Fed. Cir. 2014) (citing *NTP, Inc. v. Research In Motion, Ltd.*, 418 F.3d 1282, 1293 (Fed. Cir. 2005).

Plaintiff also cites to authority to support its proposition that “improving” is not necessarily indefinite. But the authority that Plaintiff cites is inapposite and misconstrued by Plaintiff. For example, in *Salix*, the term “adequate relief from symptoms” was held definite

² The ’259 Patent is a division of application No. 12/942,922, filed on Nov. 9, 2010, now Pat. No. 8,585,568, and claims priority to provisional application No. 61/260,779, filed on Nov. 12, 2009. The ’111 Patent is a continuation of application No. 13/858,693, filed on Apr. 8, 2013, now Pat. No. 9,308,385, and claims priority to provisional application No. 61/621,423, filed on Apr. 6, 2012.

only because expert testimony supported that patient-reported relief could reliably be used to determine whether irritable bowel syndrome was reduced by the patented technique. *Salix Pharms., Ltd. v. Norwich Pharms., Inc.*, 2022 U.S. Dist. LEXIS 142335, *66-67 (Aug. 10, 2022, D. Del.) (Andrews, J.) (trial opinion) (noting that “patient-reported ‘adequate relief is used to determine IBS-D treatment success in the field.’”). However, in the case of the ‘111 Patent, there is no support that patients are able to self report an improvement in their condition.

Plaintiff cites *Invitrogen* for the proposition that the term “*improved* competence” was construed to mean “generally increased,” “*without any specific numerical limitation.*” Brief at 21 (emphasis added). However, Plaintiff flat-out misrepresents *Invitrogen*. The Court did *not* construe “improved competence” as “generally increased.” The Court upheld the very specific construction that included a specific metric:

The phrase “improved competence” means that the number or quantity of E. coli cells that take up and establish exogenous DNA is generally increased as compared with the number or quantity generally obtained when cells are prepared by either (1) growing the cells at 37 degrees C, rendering them competent, and freezing them, or (2) growing the cells at 37 degrees C, rendering them competent, and not freezing them.

Invitrogen Corp. v. Biocrest Mfg., L.P., 327 F.3d 1364, 1369 (Fed. Cir. 2003). Similarly, in *U. S. Silica*, there was a specific metric that could be measured, *i.e.*, the strength of the adherence of the relevant particles to the asphalt layer with and without the claimed treatment. *U.S. Silica Co. v. Amberger Kaolinwerke Eduard Kick GmbH*, No. 2:20-CV-00298- JRG, p. 22 (E.D. Tex. Nov. 19, 2021) (Gilstrap, J.). The problem here is that the ‘111 Patent identifies no such metric, but instead just vaguely claims “improving Autism,” as an example. While a precise numerical goal

is not required, the patent must identify the relevant metric, like it does for Alzheimer’s as a lone example, by identifying the MMSE score as the relevant metric.

Finally, Plaintiff contends that in *Continental*, the PTAB construed the term “improved flex fatigue resistance” and noted that in that context the “meaning of ‘**improved**’ is well understood. For example, and although we acknowledge that it is extrinsic evidence, the word ‘improved,’ means to ‘make better.’” Brief at 21-22. However, the PTAB *continued*, and further noted that “the plain meaning of ‘improved,’ however, does not provide much *clarity*. So, there must be something else, some other language of import in the method claim to help the reader understand the nature of the improvement.” In other words, the phrase may be best construed by asking a very basic question—*how* is the flex fatigue resistance improved?” *Continental Ag v. Gates Corp.*, No. IPR2021-00466, 2022 WL 3012945, at *4 (P.T.A.B. July 29, 2022) (emphasis added). The Board then looked to the claim language to “determine whether there are other recitations, explanations, or limitations in the claim that perhaps best describe the improvement.” *Id.* There, it found that “the first two steps are helpful in understanding the improvement” and that “it is the last step of claim 24 where we can best understand how the flex fatigue resistance is improved.” *Id.* “The last step explains that the improvement occurs by ‘selecting said first twist multiplier to be at least about 1.5 times said second twist multiplier.’ On its face, a plain reading of the claim itself best provides the meaning of ‘improved flex fatigue resistance.’” *Id.*

Continental proves Defendant’s point: “improving” as claimed in the ‘111 Patent, wholly unexplained and a POSITA would not know when it is achieved. As in all other instances where such a term was found to be definite, at least a general guideline was disclosed to allow a POSITA to determine whether an improvement had indeed occurred. That crucial element is missing in the ‘111 Patent.

Plaintiff's references to the specification do not resolve this issue. It is not disputed that TMS and rTMS have been used to treat and improve conditions. *See* Brief at 22. And Plaintiff admits that the claim "relies on a clinical assessment that provides a baseline against which the treatment's effectiveness in reducing the patient's symptoms for the conditions can be *measured* after treatment." Brief at 23. *But*, the '111 Patent fails to provide the required "objective indication" for evaluating the condition before and after treatment. *Interval*, 766 F.3d at 1371. For that reason the claim term is indefinite.

Each of the specific examples listed (*See* Brief at 23–24), at best, identify exemplary parameters for a single condition, Alzheimer's. For example, the most specific reference in the '111 Patent is an improved MMSE score regarding Alzheimer's disease. '111 Patent, 7:39–42. In this regard, for the treatment of Alzheimer's, the term "improving" should be construed as "improving the MMSE score"—that is at least *some* metric. However, this metric cannot be generically extrapolated to any other condition, since all of the neurological conditions are vastly different, and the patent provides no basis for treating them as one.

The fact that the examiner did not object to this specific term (Brief at 24) is irrelevant to claim construction. Similarly irrelevant is the dictionary definition of "improving" (Brief at 24) or Defendant's use of the term improving (Brief at 25) – it's not the meaning of the word "improving," it's *how* it is improperly claimed by the '111 Patent. Notably, Defendants' own patents in the area do not use such an ambiguous term. U.S. Patents 11,786,747 and 11,793,456.

To be clear, the problem with this claim term is not the meaning of the term "improving" as in helping a patient's physiological and neuropsychiatric conditions to get better. The problem is that a POSITA would not be able to determine what changes in a physiological or neuropsychiatric condition would qualify as such, and whether a given change was indeed the result of the

invention and not some other cause. Dempsey Decl. at ¶ 19. The specification of the '111 Patent provides no guidance regarding measuring an “improvement.” The only references to improvement are just as ethereal as the claims themselves. *See, e.g.*, '111 Patent, 1:41–44 “an improvement . . . is achieved,” 1:59–61 (“improvements . . . are improved in a non-invasive manner”), 3:44–45 (improve the frequency coupling among organs”), 3:58 (“improve attention”). Further exacerbating the problem is that the '111 Patent discloses various degrees of improvements in a condition. *See, e.g.*, “Example 1” distinguishing between “some degree of improvement” and “significant improvement in cognitive and motor functions.” '111 Patent, 7:4–12 (emphasis added). It is unclear just *how much* improvement is required. The absence of metrics for the remaining conditions leaves a POSITA to guess as to when the claim language has been satisfied. This inability to clearly define the measure of the claims of the '111 Patent renders this claim term indefinite.

III. CONCLUSION

For the reasons listed above, Plaintiff’s proposed constructions should be rejected.

Dated: 31 May 2024

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CERTIFICATE OF SERVICE

I hereby certify that on 31 May 2024, I electronically filed the foregoing with the Clerk of the Court using the CM/ECF system, which will send notification of such filing to all counsel of record.

/s/ Henning Schmidt
Henning Schmidt